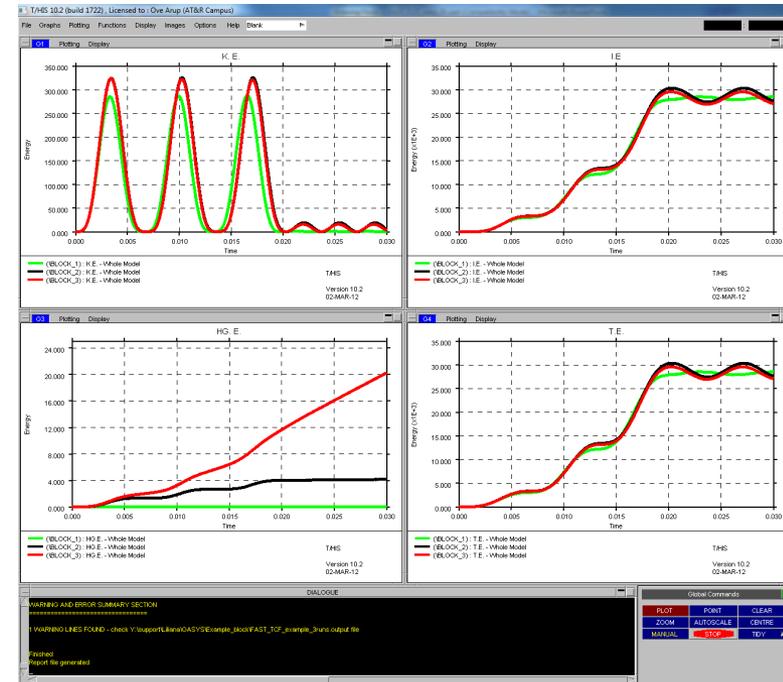


FAST-TCF – Tutorial

March, 2012

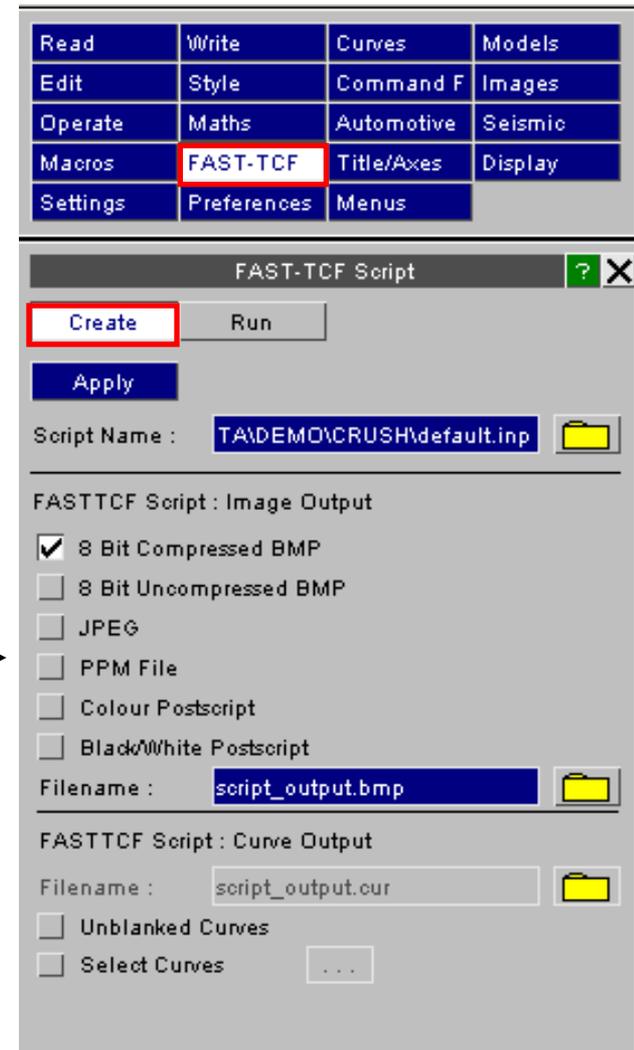
- This document contains a step-by-step tutorial for building a FAST-TCF script that will extract time-history results from three LS-DYNA analyses.
- The results will look similar to the graphs showed here.
- The first few slides that follow contain some general information, followed by the tutorial.
- This document is distributed together with some example files:
 - Runs: BLOCK_1 to BLOCK_4
 - Example FAST-TCF script: 'FAST_TCF_example_3runs_1.inp'



- FAST-TCF is a scripting language for T/HIS, for use with automatic post-processing.
- Scripts are easy to write and edit by hand, and can also be recorded by T/HIS.
- A FAST-TCF script can contain all of the commands to setup and position multiple graphs, read in data, perform curve operations and generate output.

- Automatic generation of FAST-TCF scripts
 - Records operations that created the currently visible curves
 - More robust than command files, not dependent on history
 - Easily editable

Select file type to be generated by FAST-TCF script



FAST-TCF - Play-back of scripts



Can be played or stepped through line by line \

FAST-TCF Script

Feedback in interpreter window

The main window of the FAST-TCF Script tool. It features a title bar 'FAST-TCF Script' with a help icon and a close button. Below the title bar are 'Create' and 'Run' buttons. The 'Script Name' field contains ':\\DATA\\DEMO\\CRUSH\\fd.inp'. There are 'Reread' and 'Model Mapping' buttons. A checkbox for 'Auto confirm text boxes' is present. Below these are 'Play' and 'Step' buttons, and an 'End' button. The main area is a text editor showing the script content: '# Program: FASTTCF', '# Filetype: Bitmap', '# Filename: script_output.bmp', '# Job file: H:\\DATA\\DEMO\\CRUSH\\BASE\\base.thf', '#', and 'model none'. At the bottom, there is a 'T/HIS command line' field.

- Model Mapping – used with multiple models to define which model in T/HIS corresponds to which model in the script.

A dialog box titled 'FAST-TCF Script' with 'Apply' and 'Cancel' buttons. It contains a table for mapping script IDs to T/HIS Model IDs. The first row is selected, showing 'Script ID 1' and 'T/HIS Model ID 1'. A dropdown menu is open for the 'Select Model' column, showing options 1 through 5. The value '= 1.50' is visible next to the dropdown.

Script ID	T/HIS Model ID
1	1
	2
	3
	4
	5

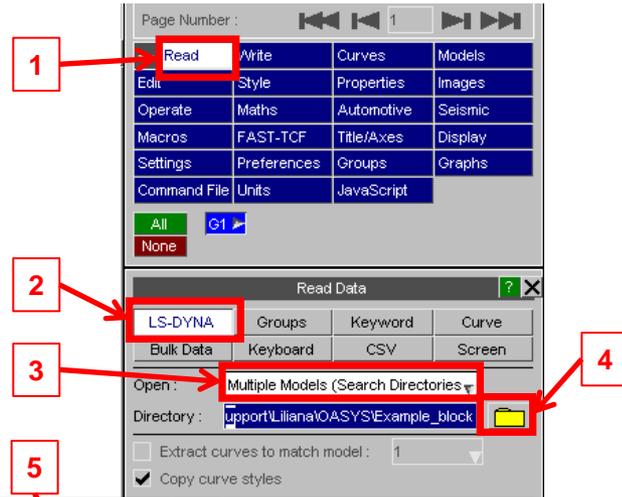
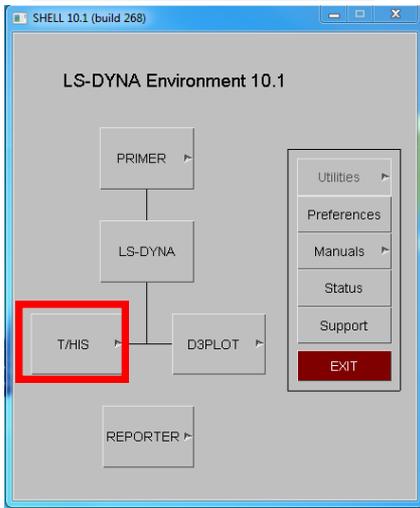
- The following slides contain a step-by-step tutorial, showing an example for building a FAST-TCF script that will extract time-history results from three LS-DYNA analyses.

FAST-TCF - Example

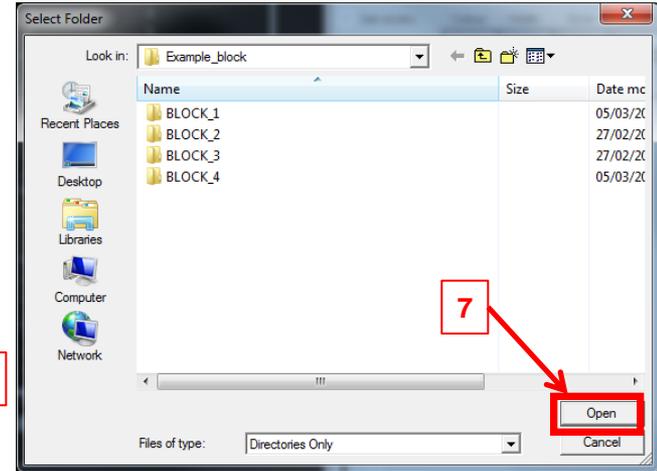
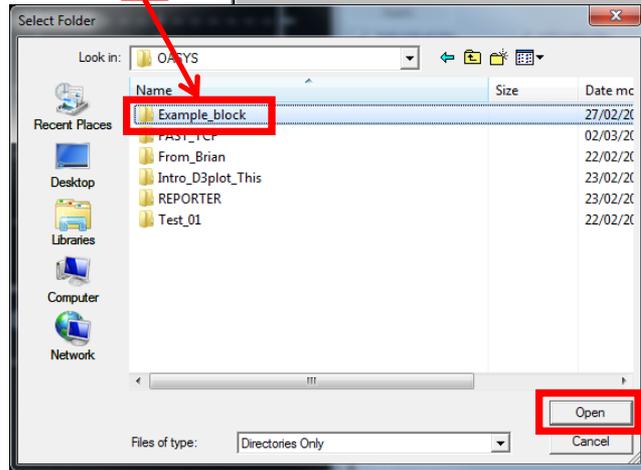


- The first step is to open the three models in T/HIS: BLOCK_1, BLOCK_2 and BLOCK_3, follow steps 1-9 (see next slide as well).

Open T/HIS using the Oasys Shell:



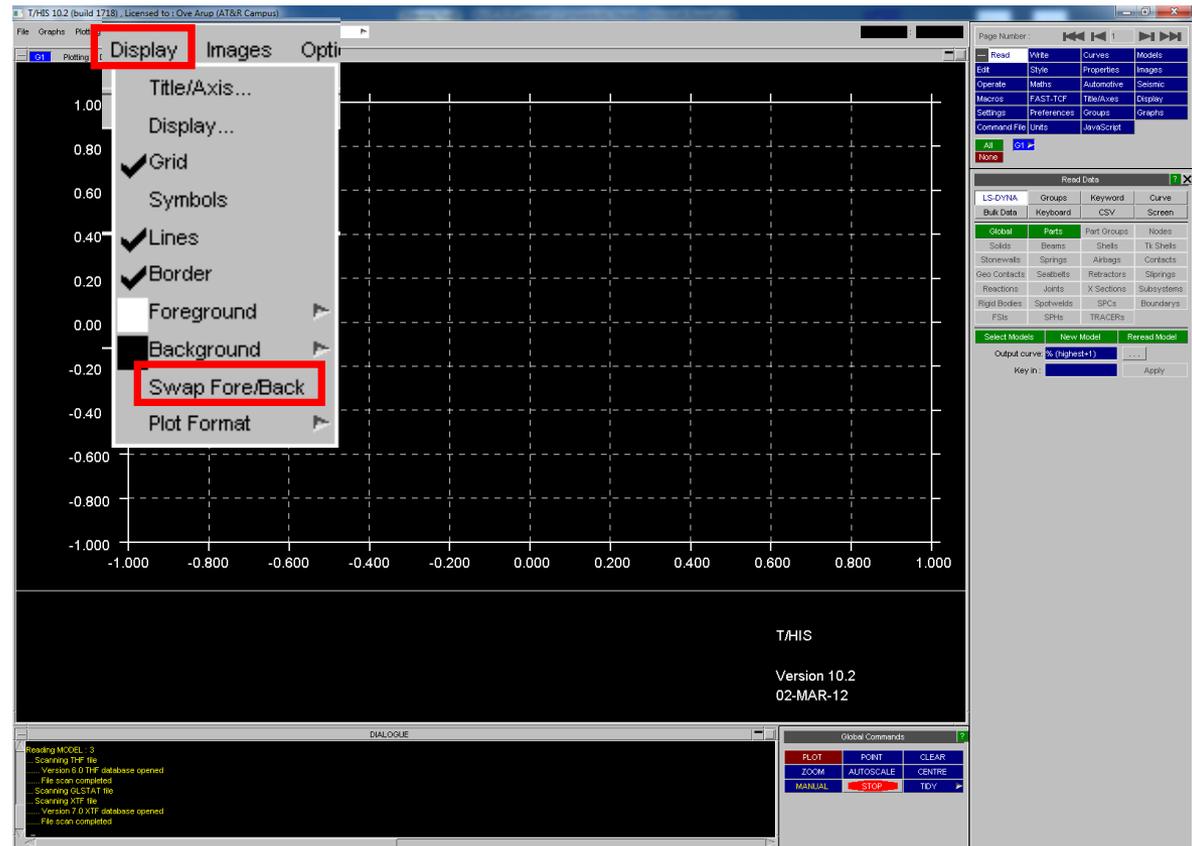
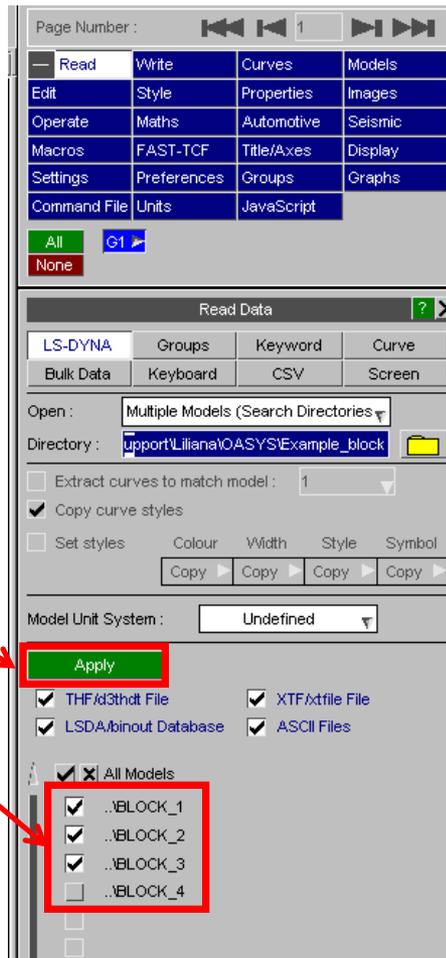
Open the models using 'Multiple Models (Search Directories)' option; alternatively, the models can be read in one by one.



FAST-TCF - Example



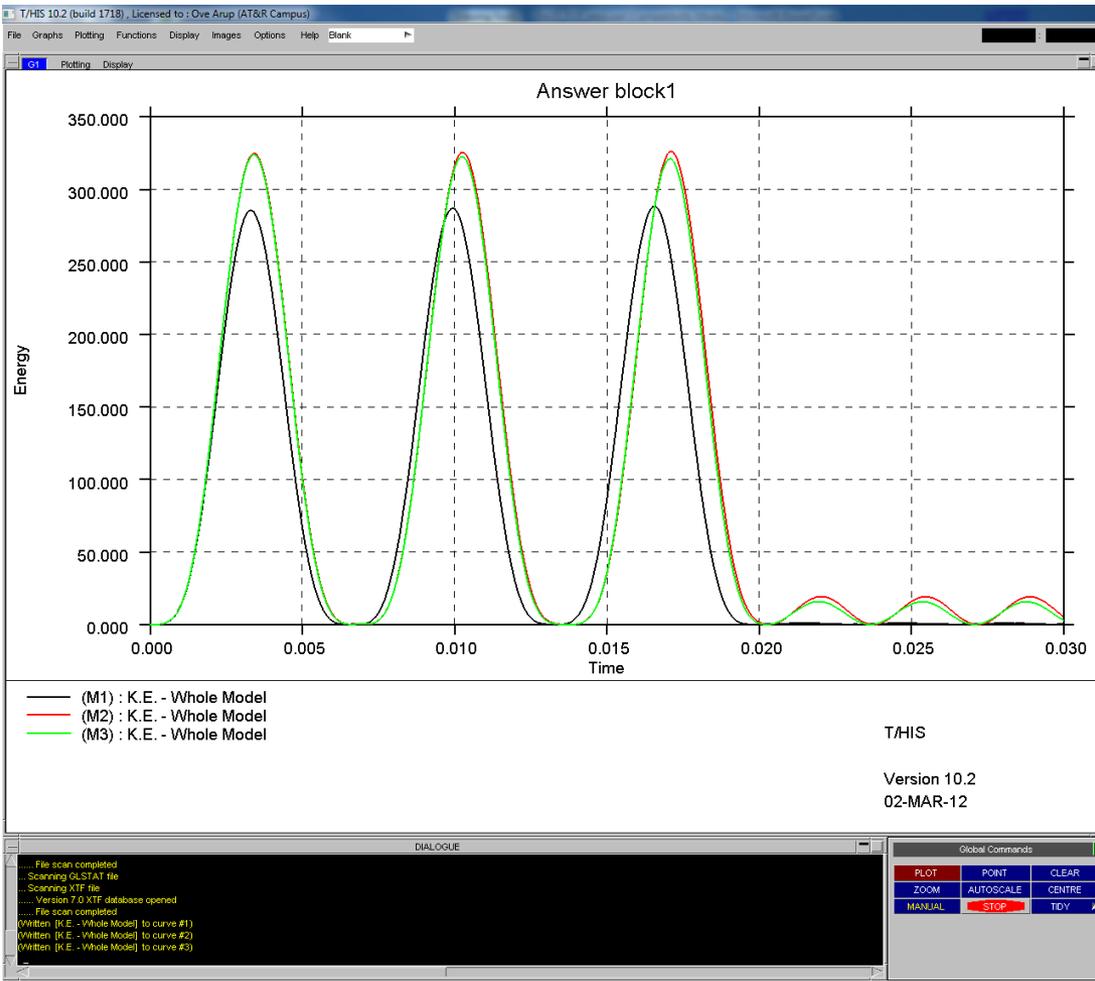
The colour of the background in T/HIS is by default black – to change this click on 'Display'-> Swap ForeBack (this can be set in the oa_pref file).



FAST-TCF - Example



- Plot the Kinetic Energy (KE) for the three analyses:



Read Data

LS-DYNA	Groups	Keyword	Curve
Bulk Data	Keyboard	CSV	Screen
Global	Parts	Part Groups	Nodes
Soils	Beams	Shells	Tk Shells
Stonewalls	Springs	Airbags	Contacts
Geo Contacts	Seatbelts	Retractors	Sliprings
Reactions	Joints	X Sections	Subsystems
Rigid Bodies	Spotwelds	SPCs	Boundaries
FSIs	SPHs	TRACERs	

Select Models: New Model, Reread Model

Output curve: % (highest+1)

Key in: Apply

DT - Time step

KE - Kinetic energy

IE - Internal energy

SWE - Stonewall energy

SPE - Spring and damper energy

HG - Hourglass energy

SDE - System damping energy

JE - Joint internal energy

SIE - Sliding interface energy

EW - External work

RBE - Rigid Body stopper energy

TE - Total energy

TER - Total/Initial energy

VX - Average X velocity

VY - Average Y velocity

VZ - Average Z velocity

TZC - Time per zone cycle

MA - Total mass

AM - Added mass

PM - %age Mass increase

EKE - Eroded Kinetic energy

EIE - Eroded Internal energy

ER - Energy Ratio w/o Eroded

Entities: Sort By Model

All None

Select MODEL(s)

M1:Whole Model

M2:Whole Model

M3:Whole Model

FAST-TCF - Example

- To create another 3 graphs go to Graphs-> Options, tick 2x2 and click 'Create Graphs', repeat 2 more times, then close the Graph Layout panel:

The image illustrates the steps to create multiple graphs in Oasys T/HIS. It shows the 'Graphs' menu with 'Options...' selected, the 'Options...' dialog box where '2 x 2' is selected under 'Automatic Page Layout', and the resulting 2x2 grid of plots. Red boxes and arrows highlight the key actions: 1. Clicking 'Graphs' in the menu; 2. Clicking 'Options...'; 3. Selecting '2 x 2' in the 'Automatic Page Layout' section; 4, 5, 6. Clicking 'Create Graphs(s)'; 7. Clicking the close button (X) in the 'Graph Layout' panel.

1

2

4,5,6

3

7

FAST-TCF - Example



- Read Internal Energy (IE) in the second graph.
- Repeat steps 1-3 to read HG energy in the 3rd graph and TE in the 4th graph.

Make only Graph 2 active: G2->Only

Page Number : 1

Read	Write	Curves	Models
Edit	Style	Properties	Images
Operate	Maths	Automotive	Seismic
Macros	FAST-TCF	Title/Axes	Display
Settings	Preferences	Groups	Graphs
Command File	Units	JavaScript	

All G1 G2 G3 G4
None

Raise
Delete

T/HIS 10.2 (build 1718), Licensed to : Ove Arup (AT&R Campus)

Graph 1: Energy vs Time (0.000 to 0.030). Curves: (M1) K.E. - Whole Model, (M2) K.E. - Whole Model, (M3) K.E. - Whole Model.

Graph 2: Energy vs Time (0.000 to 0.025). Curves: (M1) IE - Whole Model, (M2) IE - Whole Model, (M3) IE - Whole Model.

Graph 3: Energy vs Time (0.000 to 1.000).

Graph 4: Energy vs Time (0.000 to 1.000).

Read Data Dialog:

Global	Parts	Part Groups	Nodes
Solids	Beams	Shells	Tk Shells
Stonewalls	Springs	Airbags	Contacts
Geo Contacts	Seatbelts	Retractors	
Reactions	Joints	X Sections	
Rigid Bodies	Spotwelds	SPCs	Bour parts
FSIs	SPHs	TRACERs	

Select Models: New Model, Reread Model

Output curve: % (highest+1)

Key in:

Apply

Entities:

DT - Time step	Sort By Model
IE - Internal energy	All None
SPE - Spring and damper energy	Select MODEL(s)
HG - Hourglass energy	M1:Whole Model
SDE - System damping energy	M2:Whole Model
JE - Joint internal energy	M3:Whole Model
SIE - Sliding interface energy	
BW - External work	
RBE - Rigid Body stopper energy	
TE - Total energy	
TER - Total initial energy	

Global Commands: PLOT, POINT, ZOOM, AUTOSCALE, MANUAL, STOP

FAST-TCF - Example



- Close the Read Data panel (right corner cross) and the results will look similar to below:

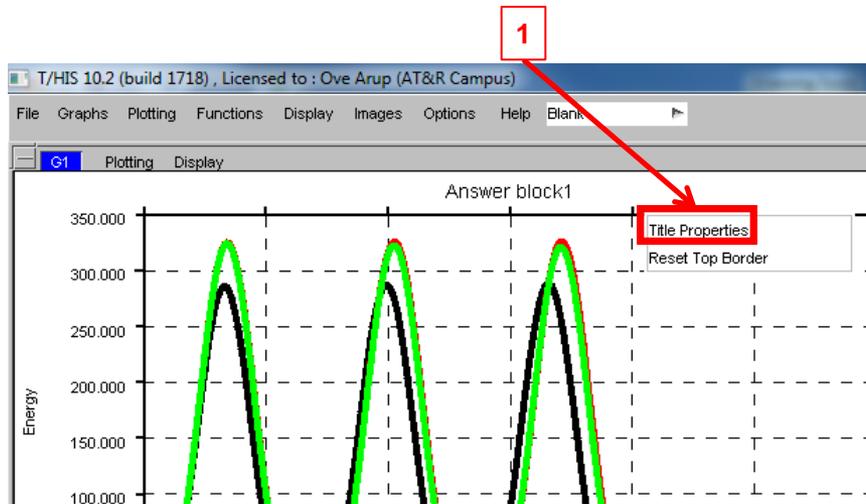
The screenshot displays the T/HIS software interface with four plots and a Curve Manager panel. The plots show Energy vs. Time for different models (M1, M2, M3) under various conditions (K.E., I.E., H.G.E., T.E.). The Curve Manager panel on the right lists 16 curves with their respective labels and styles. A red box highlights the 'All' button in the Curve Manager, and another red box highlights the 'Display' button in the top menu. A third red box highlights the 'Line Width' setting in the Display Options panel.

You can change the thickness & style of curves. To make all the curves thicker, first make all graphs active: All; then Display->right click on Line Width->select 3rd line. Close the Display Options panel.

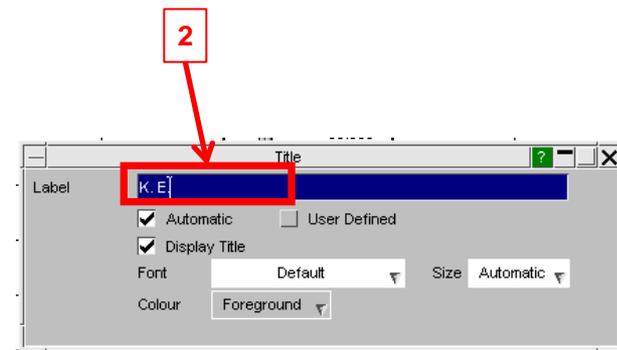
The Display Options panel shows settings for Lines, Symbols, Grid, Axis, Border, Fix Styles, Background, and Foreground. A red box highlights the 'Line Width' setting, which is set to the 3rd line in the dropdown menu.

- Add titles to each graph:

With the mouse over the top horizontal line of the graph, right click and select 'Title Properties'



Type in the title: K.E. for the first graph. Repeat with appropriate titles for the other graphs.



FAST-TCF - Example

- In this example it would be useful if the curves were coloured by model:

1

2

3

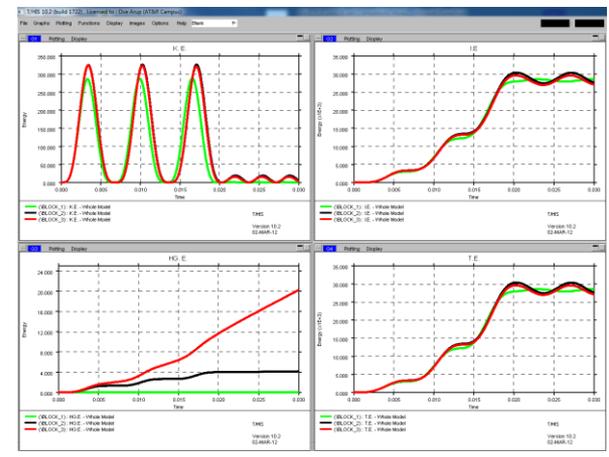
4

5

6

7

Repeat steps 4-7 for the other two models: Block 2 and Block 3.



FAST-TCF - Example

- When comparing several models it is useful to show the run Directory name (by default T/HIS shows Model number). To change this follow the steps below.

Want to change this:

1 Options Help Blank
Command File
Settings
FAST-TCF
Convert LSDA->ASCII
Edit Preferences
Menu Attributes
Auto Update
(A) Show Model Prefix
Prefix Format
Drag with curves
Shortcuts

2
3

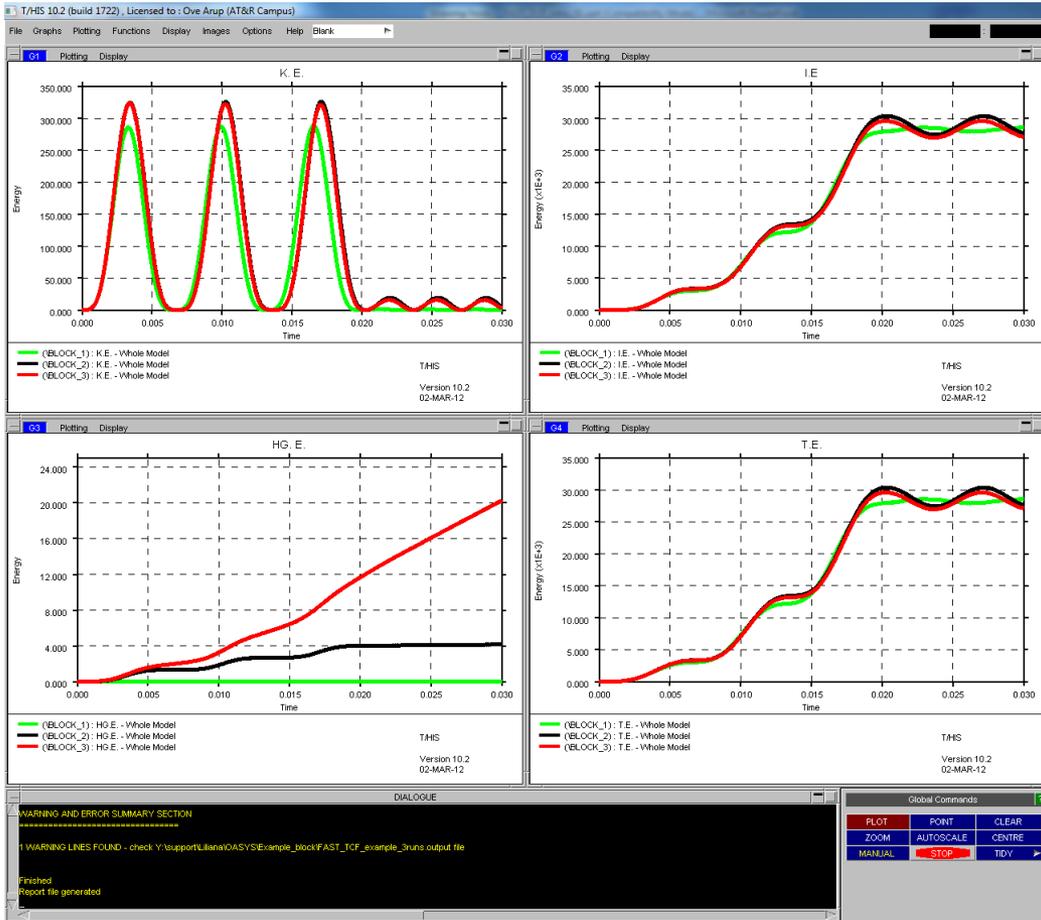
The directory names are now showed:

(\BLOCK_1) : K.E. - Whole Model
(\BLOCK_2) : K.E. - Whole Model
(\BLOCK_3) : K.E. - Whole Model

FAST-TCF - Example



- We are now ready to create the FAST-TCF script, which in the future can be run to rebuild this graph automatically:



The screenshot shows the "FAST-TCF Script" dialog box with the following elements:

- Page Number:** 1
- Buttons:** Read, Write, Curves, Models, Edit, Style, Properties, Images, Operate, Maths, Automotive, Seismic, Macros, FAST-TCF, Title/Axes, Display, Settings, Preferences, Groups, Graphs, Command File, Units, JavaScript.
- FAST-TCF Script Dialog:** Create, Run, Apply.
- Script Name:** kFAST_TCF_example_3runs.inp
- Generate for:** All Pages, Current Page, Only Page 1, All Graphs, All Active Graphs, Only Graph 1.
- FASTTCF Script : Image Output:** Format: 8 bit BMP (Compressed), Filename: script_output.bmp
- FASTTCF Script : Curve Output:** Filename: script_output.cur, Unblanked Curves, Select Curves
- FASTTCF Script : Curve Group Output:** All Curve Groups, Select Curve Groups

Save the FAST-TCF file as a new file , for example 'FAST_TCF_script.inp'.



FAST-TCF - Example

- Now test the new script on a different set of runs: in a new T/HIS session, read for example BLOCK_2, BLOCK_3 and BLOCK_4.

Open the models using 'Multiple Models (Search Directories)' option, as before.

1

2

4 - un-tick the FIRST run!

Open and run your script.

1

2

3

4

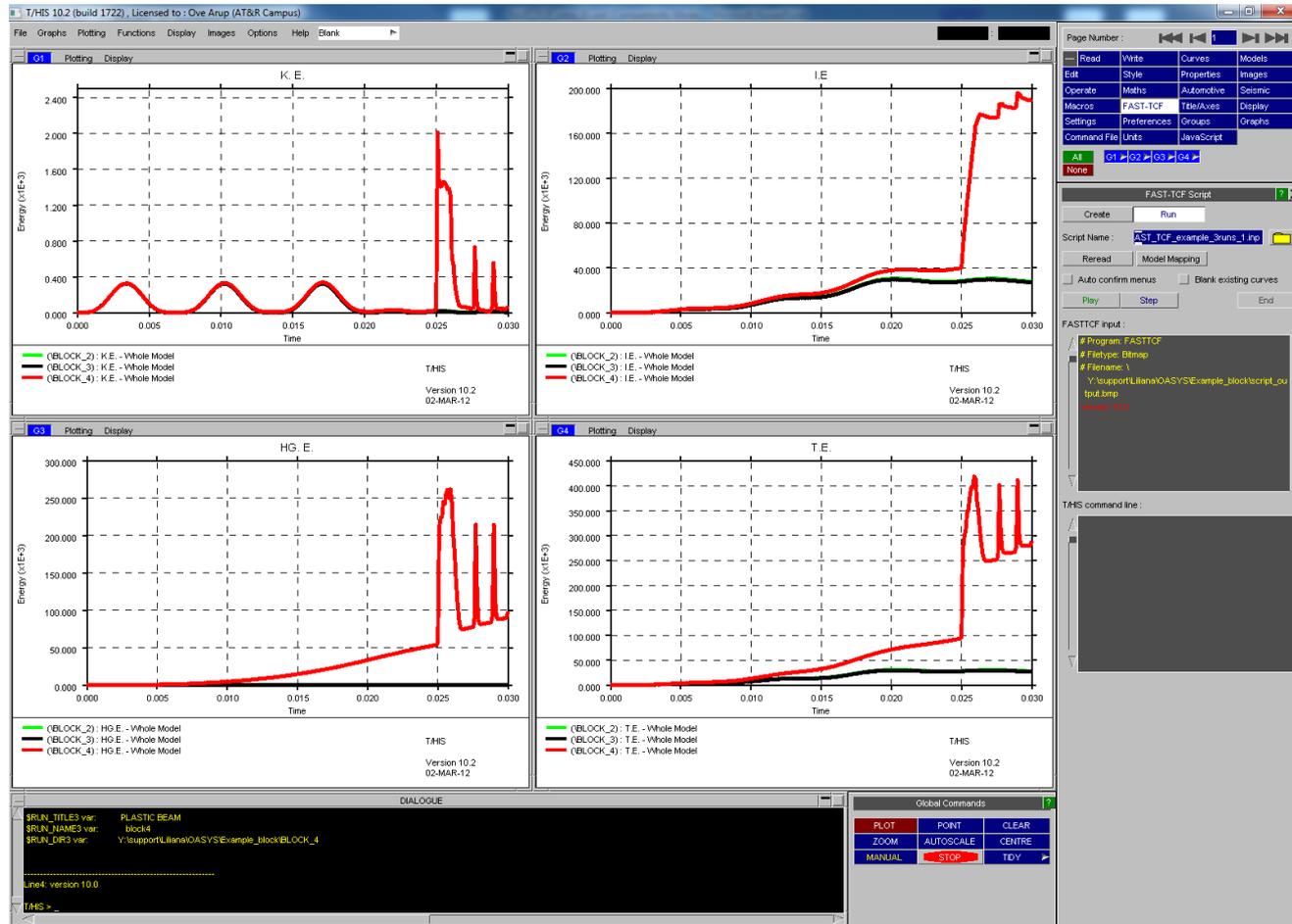
```
FASTTCF input :
^ display curve_22 curve_23 curve_24
#
# Generate Images
#
image i-resolution screen
image bmp \
"Y:\support\Liliana\OASYS\Example_block\script_o
utput.bmp" page all
#
# Set all graphs active
#
layout_graph select all

T/HIS command line :
^ /de ul 2 T
/HIS de
/de ul 4 Version 10.2 de
```

FAST-TCF - Example



- The energies for the new runs, BLOCK_2, BLOCK_3 and BLOCK_4 have been extracted:



- This script will work with different models, but only on 3 models at a time. If you want to run on a different number of models, then you have to recreate the FAST-TCF for that particular scenario.
- Alternatively, a FAST-TCF script can be created which runs only on one analysis, then re-run the script on each of the models in T/HIS.
- For more information about how to use T/HIS, please see the manual and the short introduction '*THIS_intro_2012.pdf*'.
- For more details about the FAST-TCF scripts, please see the T/HIS manual, chapter 7.

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